

THE DRAWINGS

The attached sheet of drawing includes changes to Fig. 5. This sheet replaces the original sheet including Fig. 5. In Fig. 5, reference labels 503, 505, 55, 56 and 503 have been changed to 502, 503, 505, 506 and 504 respectively. Reference numeral 54 has been removed.

Attachment: Replacement Sheet

REMARKS

Applicant would like to thank the Examiner for granting a telephone interview on Thursday, September 8, 2005. This response is intended as a follow-up to that telephone interview and a full and complete response to the final Office Action mailed August 10, 2005. In the Office Action, the Examiner notes that claims 1, 2, 4-13, 15 and 16 are pending and rejected. By this response, the claims continue amended.

In view of the telephone interview and the following discussion, Applicants submit that none of the claims now pending in the application are anticipated or obvious under the respective provisions of 35 U.S.C. §102 and 103.

It is to be understood that Applicants do not acquiesce to the Examiner's characterizations of the art of record or to Applicants' subject matter recited in the pending claims. Further, Applicants are not acquiescing to the Examiner's statements as to the applicability of the art of record to the pending claims by filing the instant responsive amendments.

THE SPECIFICATION

Submitted with the amendment is a substitute specification that has been amended to correct typographical and grammatical errors. Applicants have filed herewith a marked-up copy and a clean copy of the new specification. Applicants attest that no new matter has been added.

IN THE DRAWINGS

The Applicants have filed herewith replacement sheet for FIG. 5. Further, the Applicant has amended the drawings to conform to the specification. In particular, the Applicant has amended FIG. 5 to correctly show the reference numbers 502, 503, 504, 505, 506, as provided in Applicant's specification on page 6, line 29 through page 7, line 4. The Applicant submits that such change to the drawing does not add new subject matter.

REJECTIONS

35 U.S.C. §102

Claims 1, 2, 9 and 16

The Examiner has rejected claims 1, 2, 9 and 16 under 35 U.S.C. §102(e) as being anticipated by Ito (U.S. Patent 6,650,846 B1, hereinafter "Ito").

Independent claim 1 (and similarly independent claims 2 and 16) recites:

1. An optical communication system, comprising:
 - a transmitter, including:
 - a means for modulating an optical carrier in a sequence of return-to-zero (RZ) pulses;
 - a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal; and
 - a means for applying the optical phase modulated signal to a dispersion managed optical transmission link;
 - a dispersion managed optical transmission medium;
 - and
 - a receiver of the optical phase modulated signal.
(emphasis added).

"Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim" (Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)) (emphasis added). The Ito reference fails to disclose each and every element of the claimed invention, as arranged in the claims 1, 2, or 16.

As explained in the telephone interview, Ito discloses in the abstract an optical transmission system according to this invention comprises a light source, an intensity modulator for modulating the intensity of light output from the light source according to NRZ data that is transmission data, and a polarization modulator for modulating the polarization of an output from the intensity modulator according to an alternating signal. A phase modulator using a bit rate frequency sine wave as a modulation input may be

inserted between the intensity modulator and the polarization modulator. In this case, the intensity and phase modulators may be connected in the reverse order.

However, Ito does not teach, show or suggest a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal as recited in claims 1, 2, and 16.

In Ito, there is no teaching about encoding "data" (the digital information to be transmitted) on the phase of the optical signal. Ito discloses that data is always carried by the intensity of the optical signal, not the phase of the optical signal. In the Ito patent, the phase modulator only provides sinusoidal phase modulation that is identical from bit to bit regardless of the data to be transmitted. This is in sharp contrast to the present invention where phase modulation is used to impose the data, which, by its nature, varies from bit to bit.

The key concept of the modulators in the Ito patent has been repeated in several places in the Ito patent, e.g., Col. 2, lines 23-36, Col. 6, lines 15-24, Col. 10, lines 19-24, Col. 10, lines 35-39, Col.12, lines 51-56. Only Fig. 14 of the Ito patent appears to show that the phase modulator is connected to "NRZ data 105", which may have misled the examiner to believe that the Ito patent resembles our invention. A closer look reveals that the label "NRZ data 105" in Fig. 14 is an obvious typographical error. In the detailed descriptions of the Ito patent, the object "105" invariably refers to the "Bit rate frequency sine wave", whereas the object "101" invariably refers to the "data". However, Fig. 14 erroneously labeled "101" as "Bit rate frequency sine wave" and labeled "105" as "NRZ data", which contradicts the detailed description.

As such, Applicants submit that claims 1, 2, and 16 are not anticipated by Ito and fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder. Furthermore, claim 9 depends directly from independent claim 1 and recites additional features thereof. As such and at least for the same reasons as discussed above, Applicants submit that dependent claim 9 is also not anticipated and fully satisfies the requirements of 35 U.S.C. §102 and is patentable thereunder. Therefore, Applicants respectfully request the rejection be withdrawn.

35 U.S.C. §103

Claims 4 and 5

The Examiner has rejected claims 4 and 5 under 35 U.S.C. §103(a) as being unpatentable over Ito in view of Price et al. (U.S. Patent No. 6,522,439 B2, hereinafter "Price"). Applicants respectfully traverse the rejection.

The test under 35 U.S.C. §103 is not whether an improvement or a use set forth in a patent would have been obvious or non-obvious; rather the test is whether the claimed invention, considered as a whole, would have been obvious. Jones v. Hardy, 110 USPQ 1021, 1024 (Fed. Cir. 1984) (emphasis added). Moreover, the invention as a whole is not restricted to the specific subject matter claimed, but also embraces its properties and the problem it solves. In re Wright, 6 USPQ 2d 1959, 1961 (Fed. Cir. 1988) (emphasis added). The Ito and Price references alone or in combination fail to teach or suggest Applicants' invention as a whole.

For at least the reasons discussed above in Applicants' response to the Examiner's §102 rejection, the Ito reference fails to teach or suggest Applicants' invention as a whole.

In particular, the Ito reference fails to teach or suggest Applicants' claimed a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal.

Furthermore, the detection of a phase-shift-keyed or differentially phase-shift-keyed optical signal is by no means trivial. It involves either coherent detection (homodyne or heterodyne) or a delay interferometer. This is much more complex than that of the conventional on-off-keying modulation format. We note that throughout the entire Ito patent there is no mentioning of the detection of a phase-shift-keyed or differentially phase-shift-keyed optical signal.

The Ito patent clearly has nothing to do with phase-shift keying or differential phase-shift keying, which is the key ingredient in our invention that is currently under examination. As specified in claims 4 and 5 of the Applicants' invention, the transmitted information (i.e., digital data) is contained in an optical phase of the RZ pulses modulated using phase shift keying (PSK), or differential DPSK modulated formats.

The Price reference fails to bridge the substantial gap as between the Ito reference and Applicants' invention. In particular, Price discloses PSK and DPSK modulations in order to reduce the penalty of the transmission. The Price reference fails to teach or suggest Applicants' claimed a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal.

There is no motivation to combine. Even if the two references could somehow be operably combined, the combination would still lack all the limitations of the claims. Nowhere in the combined references is there any teaching or suggestion of a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal. Therefore, the Price and Ito references alone or in combination fail to teach or suggest Applicants' invention as a whole.

As such, Applicants submit that independent claim 2 is not obvious and fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. Furthermore, claims 4 and 5 depend directly from independent claim 2 and recite additional limitations thereof. As such, and at least for the same reasons as discussed above, Applicants submit that these dependent claims also are not obvious and fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Therefore, Applicants respectfully request that the Examiner's rejection be withdrawn.

Claim 6

The Examiner has rejected claim 6 under 35 U.S.C. §103(a) as being unpatentable over Ito in view of Tzukerman et al. (U.S. Patent No. 6,724,829, hereinafter "Tzukerman"). Applicants respectfully traverse the rejection.

The Tzukerman and Ito references alone or in combination fail to teach or suggest Applicants' invention as a whole. For at least the reasons discussed above, the Ito reference fails to teach or suggest Applicants' claimed modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal.

Tzukerman teaches a cable TV network using a QPSK or k-QAM type of modulation (col. 2, lines 14-17 and lines 32-35). However, Tzukerman does not teach a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal, as recited in amended claim 2. As such, Tzukerman does not teach Applicants' invention.

There is no motivation to combine. Even if the two references could somehow be operably combined, the combination still lack any teaching or suggestion of a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal. Therefore, the Ito and Tzukerman references alone or in combination fail to teach or suggest Applicants' invention as a whole.

As such, Applicants submit that independent claim 2 is not obvious and fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. Furthermore, claim 6 depends directly from independent claim 2 and recites additional limitations thereof. As such, and at least for the same reasons as discussed above, Applicants submit that dependent claim 6 also is not obvious and fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. Therefore, Applicants respectfully request that the Examiner's rejection be withdrawn.

Claims 7, 8, 10 and 15

The Examiner has rejected claims 7, 8, 10 and 15 under 35 U.S.C. §103(a) as being unpatentable over Ito in view of Suzuki et al. (U.S. Patent No. 6,005,702, hereinafter "Suzuki"). Applicants respectfully traverse the rejection.

The Suzuki and Ito references alone or in combination fail to teach or suggest Applicants' invention as a whole.

For at least the reasons discussed above, the Ito reference fails to teach or suggest Applicants' invention as a whole. In particular, the Ito reference fails to teach or suggest Applicants' claimed a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal.

Suzuki teaches an optical transmission system ("device") using a chirped return-to-zero (CRZ) on/off keying (OOK) modulation format. A channel transmitter includes an electro-absorption modulator 23, an intensity modulator 25, and a phase modulator 27 (33) or a frequency modulator 29 and the modulators 23 and 25 (FIGS. 2, 3, and 6). Digital data signals are superposed onto return-to-zero (RZ) optical pulses by applying to these pulses a phase or frequency modulation, which is in synchronization with a transmission rate, to generate pseudo-random optical signals (col. 1, line 66 - col. 2, line 5; col. 2, lines 10-19; and col. 4, lines 5-15).

However, Suzuki does not teach, show or suggest an optical communication system where a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal, as recited in claims 1, 2, and 16.

There is no motivation to combine the references. Even if the two references could somehow be operably combined, the combination would still lack any teaching or suggestion of a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal. Therefore, the Ito and Suzuki references alone or in combination fail to teach or suggest Applicants' invention as a whole.

As such, Applicants submit that independent claims 1 and 2 are not obvious and fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Furthermore, claims 7, 8, 10 and 15 depend directly from independent claims 1 and 2 and recite additional limitations thereof. As such, and at least for the same reasons as discussed above, Applicants submit that these dependent claims also are not obvious and fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Therefore, Applicants respectfully request that the Examiner's rejection be withdrawn.

Claim 11

The Examiner has rejected claim 11 under 35 U.S.C. §103(a) as being unpatentable over Ito in view of Fukuchi et al. (U.S. Patent No. 5,745,613, hereinafter "Fukuchi"). Applicants respectfully traverse the rejection.

The Fukuchi and Ito references alone or in combination fail to teach or suggest Applicants' invention as a whole.

For at least the reasons discussed above, the Ito reference fails to teach or suggest Applicants' claimed a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal.

Fukuchi teaches a WDM system ("apparatus") having a transmission channel includes a LiNbO₃ modulator. However, Fukuchi does not teach a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal. Furthermore, Fukuchi cannot be utilized to modify the system described by Suzuki in a manner that would result in the optical communication system recited in claim 2. As such, Ito and Fukuchi, alone or in a combination, would not produce Applicants' invention recited in claim 2.

Even if the two references could somehow be operably combined, the combination would lack any teaching or suggestion of a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal. Therefore, the Ito and Fukuchi references alone or in combination fail to teach or suggest Applicants' invention as a whole.

As such, Applicants submit that independent claim 2 is not obvious and fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. Furthermore, claim 11 depends directly from independent claim 2 and recites additional limitations thereof. As such, and at least for the same reasons as discussed above, Applicants submit that dependent claim 11 is also not obvious and fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. Therefore, Applicants respectfully request that the Examiner's rejection be withdrawn.

Claims 12 and 13

The Examiner has rejected claims 12 and 13 under 35 U.S.C. §103(a) as being unpatentable over Ito in view of Smith (U.S. Patent No. 4,847,477, hereinafter "Smith"). Applicants respectfully traverse the rejection.

The Smith and Ito references alone or in combination fail to teach or suggest Applicants' invention as a whole.

For at least the reasons discussed above, the Ito reference fails to teach or suggest Applicants' claimed a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal.

Smith teaches a method and apparatus reducing laser beam fluctuations for use in optical communication employing PSK and DPSK modulation schemes (Abstract; col. 1, lines 5-15). However, Smith does not teach an optical communication system where a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal, as recited in amended claim 1. As such, Smith does not teach Applicants' invention.

Furthermore, Smith cannot be utilized to modify the system described by Suzuki in a manner that would result in the optical communication system recited in claim 1. As such, Suzuki and Smith, alone or in a combination, would not produce Applicants' invention recited in claim 1.

There is no motivation to combine these two references. Even if the two references could somehow be operably combined, the combination would still lack any teaching or suggestion of a modulator for modulating an optical phase of said pulses in accordance with an input digital data stream to form an optical phase modulated signal. Therefore, the Ito and Smith references alone or in combination fail to teach or suggest Applicants' invention as a whole.

As such, Applicants submit that independent claim 1 is not obvious and fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder. Furthermore, claims 12 and 13 depend directly from independent claim 1 and recite additional limitations thereof. As such, and at least for the same reasons as discussed above, Applicants submit that these dependent claims also are not obvious and fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Therefore, Applicants respectfully request that the Examiner's rejection be withdrawn.

CONCLUSION

Thus, Applicants submit that all claims now pending are in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the application, it is requested that the Examiner telephone Eamon J. Wall at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

9/9/05

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